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recent years much criticism has been passed upon Moritz Cantor's monumental work, written in German, yet nothing approaching it exists in the English language. Cantor is now in his eighty-seventh year and is nearly blind. If the revisions of his volumes which were planned before the war, and were to be executed by younger men, are carried out, then his history will doubtless maintain an undisputed supremacy for many years to come. Professor Miller says that Tropfke's work is "getting too old to be entirely reliable." Tropfke himself stated last spring to the present writer that his history needed revision. But Miller's criticism on Tropfke's history applies with even greater force to the general histories written in the English language.

FLORIAN CAJORI

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Dyestuffs and Coal Tar Products. Their Chemistry, Manufacture and Application. By THOMAS BEACALL, B.A., F. CHALLENGER, Ph.D., B.Sc., GEOFFREY MARTIN, Ph.D., M.Sc., B.Sc., and HENRY J. S. SAND, D.Sc., Ph.D. Pub. D. Appleton and Co. 8vo. 156 pages, 29 fig.

The critical situation which developed in the textile, leather and other industries on account of the shortage of dyes, as well as in the pharmaceutical and photographic trades on account of a similar shortage of synthetic drugs and organic chemicals was largely responsible for the publication of this book. It is virtually a reprint with certain revisions and additions of chapters from "Industrial and Manufacturing Chemistry," Vol. 1, edited by Geoffrey Martin, on the following subjects:

"Industry of Coal Tar and Coal Tar Products."
"Industry of the Synthetic Coloring Matters."
"Industry of Natural Dyestuffs."
"The Dyeing and Color-Printing Industry."
"Modern Inks."
"Saccharine and other Sweetening Chemicals."
"The Industry of Modern Synthetic Drugs."
"The Industry of Photographic Chemicals."

The field covered is so broad and presents such extreme possibilities of theoretical and

practical details that the present publication can only be looked upon as a résumé. To those having a knowledge of organic chemistry a study of the book will serve as a valuable review and a foundation for further study. A valuable feature of the book is the bibliography at the introduction of each chapter.

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PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES

THE third number of volume 2 of the *Proceedings of the National Academy of Sciences* contains the following articles:

1. *The Mechanics of Intrusion of the Black Hills (S. D.) Pre-Cambrian Granite*: SIDNEY PAIGE, U. S. Geological Survey, Washington, D. C.
2. *On the Fossil Algae of the Petroleum-Yielding Shales of the Green River Formation of Colorado and Utah*: CHARLES A. DAVIS, Bureau of Mines, Washington, D. C.
Scientific, as well as economic interest has been aroused in these shales, because they have recently been discovered to yield petroleum when subjected to destructive distillation in closed retorts. The author finds that these shales may be examined microscopically by the methods of sectioning already in use for peats and coals.
3. *Archeological Explorations at Pecos, New Mexico*: A. V. KIDDER, Department of Archaeology, Phillips Andover Academy.
The most important results are stratigraphical; various styles of pottery being found in superposition.
4. *Man and Metals*: WALTER HOUGH, U. S. National Museum, Washington, D. C.
An account is given of the author's study of the uses of fire by man in so far as the development of metallurgy is concerned.
5. *On the Observed Rotations of a Planetary Nebula*: W. W. CAMPBELL and J. H. MOORE, Lick Observatory, University of California.
The nebula No. 7009 of Dreyer's New General Catalogue is rotating about an axis

through the central nucleus nearly at right angles to the plane passing through the observer and the major axis of the image. The mass of the nebulae is apparently several times larger than that of the sun. It is suggested that the ring nebulae are not true rings, but ellipsoidal shells.

6. *A Short Period Cepheid with Variable Spectrum*: HARLOW SHAPLEY, Mount Wilson Solar Observatory, Carnegie Institution of Washington.

The star *RR Lyræ* is a periodic variable in at least three ways: first, in the light intensity; second, in the radial velocity; and third, in the spectrum which changes from F to A. A similar spectral change is found in *RS Boötis*.

7. *The Spectrum of δ Cephei*: WALTER S. ADAMS and HARLOW SHAPLEY, Mount Wilson Solar Observatory, Carnegie Institution of Washington.

At maximum the high temperature lines are very strong and the low temperature lines very weak; while at the minimum the reverse is the case. This indicates that at maximum the temperature of the gases of the star's absorbing envelope is higher than at minimum.

8. *Investigations in Stellar Spectroscopy. I. A Quantitative Method of Classifying Stellar Spectra*: WALTER S. ADAMS, Mount Wilson Solar Observatory, Carnegie Institution of Washington.

Method replaces to a considerable extent direct estimations of spectral type by numerical estimates of relative line intensity which may be made with much higher accuracy.

9. *Investigations in Stellar Spectroscopy. II. A Spectroscopic Method of Determining Stellar Parallaxes. III. Application of a Spectroscopic Method of Determining Stellar Distances to Stars of Measured Parallax*: WALTER S. ADAMS, Mount Wilson Solar Observatory, Carnegie Institution of Washington.

The method of computing absolute magnitudes and parallaxes from the variation of the intensities of lines in the stellar spectrum is

capable of yielding results of a very considerable degree of accuracy.

10. *Investigations in Stellar Spectroscopy. IV. Spectroscopic Evidence for the Existence of Two Classes of M Type Stars*: WALTER S. ADAMS, Mount Wilson Solar Observatory, Carnegie Institution of Washington.

Two groups of M stars are indicated clearly by examination of the intensities of the hydrogen lines.

11. *The Failure and Revival of the Process of Pigmentation in the Human Skin*: A. E. JENKS, Department of Sociology and Anthropology, University of Minnesota.

It is found that on the one hand, there is an extension of the albinistic areas and on the other a revival of the process of pigment metabolism within an at-one-time albinistic area.

12. *Banded Glacial Slates of Permo-Carboniferous Age, showing possible Seasonal Variations in Deposition*: ROBERT W. SAYLES, University Museum, Harvard University.

A study of the slate and tillite formations of Squantum (near Boston) affords evidence of seasonal changes in the locality, indicating that it was in a temperate zone during Permian times as now.

13. *An Extension of Feuerbach's Theorem*: F. MORLEY, Johns Hopkins University.

All circular line-cubics on the joins of four orthocentric points touch the Feuerbach circle.

14. *Deformations of Transformations of Ribaucour*: L. P. EISENHART, Department of Mathematics, Princeton University.

15. *Geographic History of the San Juan Mountains since the Close of the Mesozoic Era*: WALLACE W. ATWOOD and KIRTLEY F. MATHER, Geological Museum, Harvard University.

The study of the geography of this region is closely related to the geologic studies of the range, but may lead also to a study of anthropogeography.

16. *The Age of the Middle Atlantic Coast Upper Cretaceous Deposits*: W. B. CLARK,

E. W. BERRY and J. A. GARDNER, Geological Laboratory, Johns Hopkins University.

The several Upper Cretaceous formations of the Middle Atlantic Coast represent all of the major divisions of the European series.

17. *Upper Cretaceous Floras of the World:*

EDWARD W. BERRY, Geological Laboratory, Johns Hopkins University.

The stratigraphic position of the more important of the Upper Cretaceous floras is indicated by a diagram.

18. *Observations on Amœba Feeding on Infusoria, and their Bearing on the Surface-Tension Theory:* S. O. MAST and F. M. ROOT, Zoological Laboratory, Johns Hopkins University.

Surface-tension is probably only a small factor in the process of feeding in Amœba.

19. *The Electromotive Force produced by the Acceleration of Metals:* RICHARD C. TOLMAN and T. DALE STEWART, Department of Chemistry, University of California.

Successful attempts have been made to change the relative position of positive and negative electricity in a piece of metal by subjecting it to a large retardation.

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SPECIAL ARTICLES

THE KATA THERMOMETER AS A MEASURE OF THE EFFECT OF ATMOSPHERIC CONDITIONS UPON BODILY COMFORT

It has been clearly demonstrated by numerous investigations that the objectionable effects of the air of a badly ventilated room are chiefly thermal rather than chemical in nature. At the same time it has been recognized that the ordinary thermometer is a very inadequate measure of the discomfort experienced in such a room because the heat loss from the body surface is influenced not only by the temperature of the surrounding air but also by the humidity present and the radiant heat which reaches the body, and above all by the movement of the air. The condition in a close room has been commonly compared with that which obtains outdoors on a muggy day in

summer; yet it is clear that the outdoor temperature must be very much higher than the indoor temperature in order to produce a comparable degree of discomfort.

Dr. W. Heberden¹ pointed out these facts nearly a hundred years ago and suggested a way out of the difficulty by the observation of the rate of fall of a thermometer previously heated to a high temperature. He heated a thermometer to 100° F. and noted the number of degrees which it fell in ten minutes as a measure of "sensible cold." He records drops of from 8° to 22° in the first ten minutes.

The same device has recently been independently worked out by Dr. Leonard Hill in England² and the apparatus is now sold by Siebe Gorman and Company of Chicago under the name of the Kata thermometer.

The Kata thermometer outfit consists of two specially constructed thermometers with large bulbs and stems graduated from 86° to 110° F., one to be used as a dry and the other as a wet bulb thermometer. The bulbs are heated to about 110° and then placed in clips which hold them in a horizontal position, after drying the bare bulb on a clean cloth and jerking excess moisture off the silk covered one. The time taken to fall from 100° to 90° is then noted, best by the use of a stop-watch.

The rate of fall of both thermometers will obviously be affected by air movement and radiant heat as well as by air temperature, and that of the wet bulb by the humidity of the air as well. Dr. Hill believes that the combined influence of these factors will affect the Kata thermometers very much as it does the human body, and suggests a one-minute period for the wet bulb and a three-minute period for the dry bulb as upper limits for comfortable atmospheric conditions.

This instrument promises to be of so much assistance in the practical study of ventilation

¹ "An Account of the Heat of July, 1825; together with Some Remarks upon Sensible Cold," *Trans. Roy. Soc.*, London, 1826, Part II., p. 69.

² "The Physiology of the Open-Air Treatment," *The Lancet*, CLXXXIV., May 10, 1913, p. 1,283; see also O. W. Griffith, "Ventilation and Housing," *The Medical Officer*, XIII., June 19, 1915, p. 273.